ful meeting is anticipated. It is sixteen years since the Association met for the second time in Birmingham, and twenty-seven years since it held, in 1857, its first meeting, which also took place in that town.

WE learn from a communication of Dr. Glasenap to the Russian newspapers that there are in Russia the following private observatories: at Pervin, near Torjok, in the Government of Tver, belonging to General Maievsky; at Bunakovka, in the Government of Kharkoff, belonging to Prince Liven; and at Odessa, belonging to M. Gildesheim. A Polish gentleman, M. Wuczihowski, is building a private observatory at Belkave, near Breslau; and a Russian gentleman, W. P. Engelhardt, has a fine observatory at Dresden. The last is provided with an equatorial which has a 12-inch refractor, and is one of the most perfect telescopes. The equatorial is provided also with a 4-inch telescope with a large spectroscope. There is also a 6-inch searcher for comets, with a wide field of sight, and a selection of the best physical instruments.

THE Rev. John Stevenson is preparing for publication, by subscription, through Messrs. Blackwood and Co., a "Flora of British Fungi (Hymenomycetes)," with illustrations by Worthington G. Smith, F.L.S. The author states that he has the co-operation of the most eminent mycologists. It may be added that the value of the "Flora" will be greatly enhanced by embodying the views of Fries, contained in his "Monographia Hymenomycetum Sueciæ," a work which cannot now be obtained, only 100 copies having been originally printed. The issue of the work will depend on a sufficient number of subscribers being received by an early date, in which case the first volume will be published without delay.

A GENERAL meeting of the Mineralogical Society will be held in the library, Museum of Science and Art, Edinburgh, on Tuesday, June 24, at 12 o'clock noon. The following papers will be read:—Forms of silica, by John Ruskin, D.C.L., Slade Professor at Oxford (communicated by the Local Secretary for Scotland); application of the periodic law to mineralogy, by Thomas Carnelley, D.Sc., F.C.S., Professor of Chemistry, Univ. Coll. Dundee (communicated as above); the origin of the andalusite schists of Aberdeenshire, by John Horne, F.R.S.E., H.M. Geol. Survey; on the occurrence of prehnite and other zeolites in the rocks of Samson's Ribs and Salisbury Crags, by Andrew Taylor, F.C.S., A.G.S.E. (communicated as above); on a new locality for zoisite, by W. Hamilton Bell, F.G.S.E. (communicated as above); on diatomaceous deposits in Scotland, by Prof. W. I. Macadam, F.C.S., Hon. Sec. G.S.E.; notes on the albertite beds of Strathpeffer, Ross-shire, by William Morrison, M.A., Academy, Dingwall (communicated as above); kyanite localities in the north, and staurolite from Presholme, Enzie, Banffshire, by Thomas Wallace, High School, Inverness; the crystallography of bournonite, by H. A. Miers, B.A., British Museum, Nat. Hist. Dept.; notes on the metallic veins of the Upper Hartz, Germany, by H. M. Cadell, B.Sc., H.M. Geol. Survey (communicated as above); Scottish localities for actinolite, by Rev. W. W. Peyton; on a peculiar development of crystals of tourmaline from Lockport, N.Y. County, U.S., by R. H. Solly, F.G.S.

FATHER DENZA, Director of the Meteorological Observatory of the Turin Exhibition, is taking steps for organising observations on board the Godard captive balloon, which ascends to an altitude of from 200 m. to 300 m. The principal scientific features of the Turin Exhibition are:—(1) The collection exhibited by Prof. Sylvestri, Director of the Etna Observatory, and containing a number of specimens of amber collected on this mountain. (2) The methods employed by M. de Rossi, head of the newly-created Seismographic Service for issuing warnings of earthquakes and describing the observed phenomena. M. de Rossi has issued a catalogue of 200 pages octavo describing the principal objects exhibited, the instruments tried, the methods adopted, and the results arrived at. (3) An historical Borgho, exhibiting mediæval costumes, buildings, instruments, furniture, and methods of working. A number of people of both sexes wearing the costumes attend to this part of the Exhibition.

THREE Ministers inaugurated in state, on June 14, the National Exhibition of Rouen, which will be international for electrical purposes. In the official speeches allusion was made to the Universal Commemorative Exhibition which is to be held in Paris in 1889. The site selected is the celebrated Park of St. Cloud, and a Crystal Palace is to be built on the ruins of the old Imperial palace.

UNDER the auspices of the Norwegian Association for the Promotion of Fisheries an establishment for the hatching of cod and soles' ova has been prepared near Arendal in the Christiania Fjord. From the excellent results already obtained it has been decided to found another hatching station near Christiania.

A LARGE copper basin consisting of small pieces riveted together and several wooden kegs containing "bog butter" were recently found at a depth of 7 feet in a peat-moss, Kylealsin, Skye. The kegs are each hollowed out of a solid block of wood, and show traces of burning all over the surface. The largest measures 1 foot 7 inches in height and 3 feet 6 inches in circumference.

THE additions to the Zoological Society's Gardens during the past week include a Vervet Monkey (*Cercopithecus lalandi* ♂) from South Africa, presented by Mr. J. Bulteel; a Bonnet Monkey (*Macacus sinicus* ♀), a Macaque Monkey (*Macacus cynomolgus* ♂) from India, presented by the Committee of the Latimer Road Mission; two Black-eared Marmosets (*Hapale penicillata* ♂ ♂) from South-East Brazil, presented by Mr. J. H. Bentley; two Vulpine Phalangers (*Phalangista vulpina*) from Australia, presented respectively by Mr. McClellan and Mr. Jay; a Marsh Ichneumon (*Herpestes galera*) from South Africa, presented by Mrs. Frank; two Angolan Vultures (*Gypohierax angolensis*), a White-necked Stork (*Ciconia episcopus*), an African Tantalus (*Pseudotantalus ibis*) from West Africa, presented by Mr. Thomas J. Alldridge; a Spur-winged Goose (*Plectropterus gambensis*) from West Africa, presented by Mr. J. B. Elliott; two Mute Swans (*Cygnus olor*), European, presented by Mr. H. Welch Thornton; two Angulated Tortoises (*Chersina angulata*) from North Damara Land, presented by Mr. F. R. Hemming; a Slow-worm (*Anguis fragilis*), a Common Viper (*Vipera berus*), British, presented by Mr. T. E. Gunn; a Bonnet Monkey (*Macacus sinicus* ♂) from India, four Muscovy Ducks (*Coirina moschata*), five Royal Pythons (*Python regius*) from West Africa, deposited; an Echidna (*Echidna hystrix*), a Brush Turkey (*Tallegala lathami*) from New South Wales, two Red-cheeked Colys (*Colius erythromelon*) from South Africa, four Bronze-winged Pigeons (*Phaps chalcoptera* ♂ ♂ ♀ ♀) from Australia, a Great-billed Parrakeet (*Tanygnathus megalorhynchus*) from Ceram, a Mealy Amazon (*Chrysotis farinosa*) from South America, four White Storks (*Ciconia alba*), European, a Kingfisher (*Alcedo ispida*), British, purchased; a Collared Fruit Bat (*Cynonycteris collaris*), a Japanese Deer (*Cervus sika* ♀), six Chiloe Wigeons (*Mareca chiloensis*), four Chinese Blue Magpies (*Cyanopolius cyanus*), bred in the Gardens.

OUR ASTRONOMICAL COLUMN

RECENT IMPROVEMENTS IN ASTRONOMICAL INSTRUMENTS.—Acting under the directions of the Secretary of the Navy, Prof. Newcomb last year visited the principal Observatories on the continent of Europe for the purpose of collecting information relating to the most recent improvements in astronomical

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instruments and methods of observation; and in a Report which has been laid before Congress and printed he has embodied the main results of his journey. The establishments visited were the Observatories of Paris, Neuchâtel, Geneva, Vienna, Berlin, Potsdam, Leyden, and Strasburg, and the workshop of Messrs. Repsold at Hamburg. Prof. Newcomb acknowledges the cordial reception he met with from the directors and astronomers of the various observatories, and the facilities everywhere afforded him for the execution of his mission. Most interest attached to the great refractor constructed for the Observatory at Vienna by Howard Grubb of Dublin, which was completed in 1881, but, owing to various delays, had hardly been brought into active operation at the time of Prof. Newcomb's visit in April 1883. Nevertheless he was able to compare it in several respects with the great Washington telescope, which is of only one inch less aperture. He considers that "as a piece of mechanical engineering it reflects great credit upon its designer and constructor." The chief drawback he remarked, the reasons for which were not evident either to him or to Dr. Weiss, the Director of the Observatory, consisted in the failure of the friction-rollers for easing the motion in declination; this motion was found much more difficult than in the case of the Washington telescope. Prof. Newcomb also points to the absence of any rough setting either in right ascension or declination, and the impossibility of seeing the pointing in declination except when the observer was at the eyepiece. With regard to the objective he considers, from such observations as he was able to make, that, "if any defects exist, they are so minute as not to interfere in any important degree with the finest performance of the instrument," and its proper figuring is rightly considered the most difficult task in the construction of a large telescope. In the workshops of Messrs. Repsold at Hamburg Prof. Newcomb had the advantage of meeting M. Otto Struve, and discussing with him the arrangements for mounting the 30-inch refractor intended for the Imperial Observatory at Pulkowa, the most striking feature in which is the absence of friction-rollers from the declination axis; he describes the system of wheelwork destined to obviate the difficulty of turning so large an instrument either by hand or a rope attached to the two ends of the axis, as at Washington and Vienna, owing to the amount of the friction. The eyepiece micrometers, as now constructed by the Repsolds, are commended for their rapid and convenient use. Amongst his general practical conclusions Prof. Newcomb expresses the opinion that in the mounting of instruments of the larger size, in order to secure necessary stiffness with the least weight, the axes should be hollow. He does not consider that it is worth while to attach friction-rollers to the declination axis, unless further experiment should show that they can be rendered more effective than in the Vienna equatorial. The old system of attaching a single finder to that side of the telescope which is opposite the declination axis, he remarks, is insufficient in the case of a large instrument, owing to the necessity of setting the opening in the dome not only to the telescope but to the finder, and suggests the desirability of adopting the plan in the Vienna instrument, which has two finders, the one above and the other below the telescope when in the meridian—a plan obviating all difficulty. The Report further explains the principle of the equatorial *coudé*, or elbow-shaped equatorial, of the Paris Observatory. The Strasburg meridian-circle, "commonly considered to embody the latest conceptions in astronomical mechanics," is noticed in some detail; Prof. Newcomb thinks a degree of stability has been secured in it which has never before been reached, and he was at much pains to obtain data for comparing the instrument with the meridian-circle at Washington; its general design he describes as similar to that of the great meridian-circle at Harvard College Observatory, which was constructed by Troughton and Simms of London. The reader must be referred to the Report for other particulars bearing upon meridian instruments.

THE ASPECT OF URANUS.—In a note communicated to the Paris Academy of Sciences on June 9, MM. Henry state that, observing on very fine nights with the 15-inch refractor, they have satisfied themselves of the existence of two gray belts, straight and parallel, and placed almost symmetrically with respect to the centre of the disk of Uranus, and that, by measures of their direction, they have found an inclination of about 41° to the direction of the orbits of the satellites; they assume that the planet's equator is in the direction of the belts. Astronomers will probably look for confirmation of such an anomaly to our larger instruments.

THE CONTINUITY OF THE PROTOPLASM THROUGH THE WALLS OF VEGETABLE CELLS

AMONG the numerous generalisations of modern botany there are perhaps few that promise to have more important consequences than the recent statements to the effect that the protoplasmic contents of the cells of plants are not entirely shut off from one another by the cell-walls, but that arrangements exist of such a kind that more or less delicate strands of protoplasm pass through from one cell to another, piercing the cell-walls either at numerous points at certain thinner spots, or simply here and there.

Th. Hartig in 1837 distinguished certain constituents of the bast of phanerogams which we now know as sieve-tubes. Investigated later by the same observer and by Mohl, Nägeli, Sachs, and Hanstein, the question as to whether the septa between the cylindrical constituents of these tubes are really perforated, or simply studded with thin pits, was set at rest by the demonstration that strands or cords of protoplasmic substance pass through definite pores or passages in the septa or cell-walls. This discovery then became common property, abundantly confirmed, and is now practically demonstrated by students in every properly conducted botanical laboratory: it remained somewhat isolated for many years, however.

In 1880 the botanical world was startled by Tangl's discovery that the cells of the endosperm of certain seeds (*Strychnos*, *Areca*, &c.) present a similar feature—that delicate filaments of protoplasm traverse the cell-walls through fine perforations, and so place the protoplasmic contents of the cells in direct continuity one with another.

In 1882 Gardiner showed that a similar continuity of the protoplasm exists between the cells of the motile organs of certain sensitive plants, and there can be no doubt that the communication thus established through the cell-walls is instrumental in causing the propagation from cell to cell of the stimulus which induces the movement. It thus becomes established that the cell-walls of plants can no longer be regarded as entirely separating off the contents of one cell from those of another; but that, in many cases at any rate, the idea of the individuality of the vegetable cell becomes as difficult to maintain as did that of animal cells after the first struggles which resulted in the overthrow of the old cell theory.

Since 1882, Gardiner has succeeded in extending his results, and has shown that the cells of numerous other parts of plants are in continuity in the same manner, by strands of protoplasm passing through the cell-walls. These researches are, moreover, confirmed by Russow for certain cells of the parenchyma of bast and medullary rays; and there seems little need of hesitation to accept generally the view that the cells of plants are not closed sacs as was formerly believed, but are provided with passages through their walls, through which fine filaments of protoplasm communicate. Such at least results from the observations so far, and especially those of Gardiner, on the endosperms of a large series of plants. It may now be stated, however, that this is not the only evidence to be quoted in support of the above generalisation. In addition to the observations of Nägeli, Pringsheim, and others, pointing out that the protoplasm frequently adheres to the cell-walls so closely at certain places that it may be pulled out into strands, or even break away, leaving portions on the walls, Gardiner has also made observations which confirm this, and which strongly favour the view that the protoplasmic strands are held fast at the points where they traverse the cell-walls. Bower has also observed similar phenomena in the withdrawal of the peripheral protoplasm in plasmolysis.

Moreover, it has been pointed out that in the case of cells with very thick walls, the thin pits are normally found to meet on opposite sides; the same is the case with the radiating strands in *Volvox*, and where two opposite strands reach the common cell-wall at different angles, they nevertheless meet at a point.

So far, however, there is no evidence to show whether the continuity of the protoplasmic strands is maintained from the earliest stages, or is established later. This, however, is a very important question in connection with this subject, since the answer to it will materially affect our views as to the nature of the cell. If the cell-walls produced in vegetative division are not complete septa, but membranes filling up the interstices between continuous strands of protoplasm, then the continuity of the protoplasm through the wall of vegetable cells is simply to be regarded as an expression of the fact that the entire plant or

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